

Petrochemicals due for rough start in '980's
A Key Chemicals Review Page 10

Chemical &
Engineering

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NEWS

November 19, 1979

CHEM SHOW

Biennial exhibit of process equipment Page 41

Cover: Photo courtesy of BASF

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News of the Week

- **Estimates of potential stratospheric ozone loss** due to chlorofluorocarbons in NAS report are almost double those of earlier figures; Du Pont cites British study that reaches different conclusions. **Page 6**

- **Monsanto's new gas-separation technology** employs Prism separator modules, single-ended bundles of tubular membranes made of coated polysulfones. **Page 6**

- **Albert C. Zettlemoyer** is ACS president-elect for 1980; Robert W. Parry and William J. Bailey re-elected directors-at-large; Gordon L. Nelson retains directorship in Region I; Bernard S. Friedman will represent members in Region V. **Page 7**

- **Three rail accidents** involving tank cars carrying hazardous chemicals led to evacuation of residents from Ontario, Florida, and Michigan cities. **Page 8**

- **Nuclear power industry executives**, troubled by NRC moratorium on licensing, cite remedial efforts already under way to solve technical problems, set up training programs for reactor operators. **Page 8**

Business

- **U.S. petrochemicals producers** expect only small financial gains in 1980 after surprisingly high production, profits in 1979; big worry is rising raw materials cost, as gasoline competes for feedstock. **Page 10**

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- **Canadian chemical industry earnings recovery** continues in third-quarter 1979; combined earnings for four largest firms rose 173% above third-quarter 1978. **Page 22**

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- **Many public-interest activists**, attracted by Carter's environmental stand, have taken positions in the Administration with hopes of influencing policy decisions. **Page 25**

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Chem Show

Exhibitors of industrial equipment at the biennial exposition are concerned about the uncertainty of the business climate; namely, the effect of inflation and nonproductive investment on chemical industry capital spending plans. **Page 41**

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Surge in petrochemicals due to subside

Small gains are in store in 1980 following surprisingly high production and profits in 1979; big worry next year is raw materials costs

This year turned out to be a fooler on the plus side for U.S. petrochemical producers. The main concern now is that 1980 doesn't wind up a fooler the other way.

A year ago, the major building-block petrochemicals showed distinct but not decisive signs of the explosion to come. Prices were well up in aromatics, exports for derivatives good all around, competition apparent from gasoline for raw materials.

However, the verdict at the time was that petrochemicals had too much unused plant capacity to translate these forces into major market gains, especially in profitability (C&EN, Nov. 20, 1978, page 12). This view underestimated the power of the business burst which followed.

The recession expected by many receded like a mirage in most markets in 1979. Instead, general business

barreled along in most areas, except consumer durables such as automobiles and housing.

The swelling pace lifted petrochemical demand to twice the gain expected in the industry as the year began. For the five leading petrochemicals covered in the following pages—ethylene, propylene, butadiene, benzene, and *p*-xylene—U.S. production increased 10% in 1979 to a combined 65.8 billion lb. About 40% of this volume, or 26.5 billion lb, was sold on the merchant market; producers used the rest in derivatives.

Even more surprising was the leap in market value for petrochemicals in 1979. With a combined price pickup of 26% to an average of 17 cents a lb from 13.6 cents a lb in 1978, the five leading petrochemicals were worth 39% more in merchant sales of \$4.5 billion this year. Profits probably more than doubled.

The large volume gain in petrochemicals ate up some of their 21% unused plant capacity from 1978, but only 1% or so. Although this gain was better than the expected decline in use rates, it could not account for much of petrochemicals' improved financial performance.

Despite the official margin of unused plant capacity, petrochemicals went into snug supply. This allowed

producers to pass along increased costs to customers and rescue low profit margins besides.

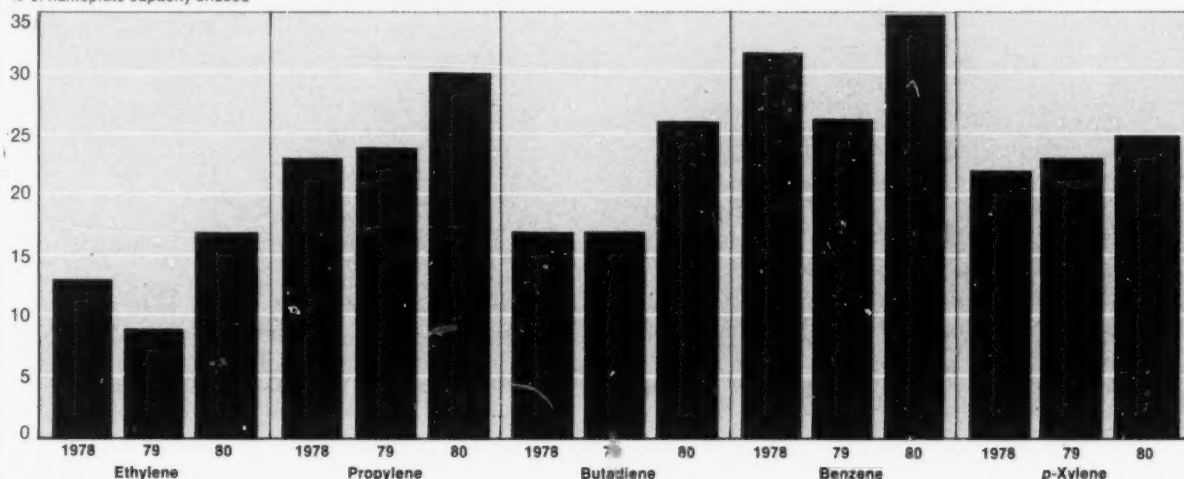
The tight supply development was due to feedstock problems, which put a ceiling on production. The villain of the piece, at least to petrochemical producers, was gasoline. Gasoline shortages, especially of high-octane grades, led oil companies to divert mixed aromatic streams and propylene at oil refineries and some pyrolysis gasoline streams (aromatics) at ethylene-producing steam crackers to gasoline needs. Prices for these materials skyrocketed. Petrochemical producers substituted some natural gas liquids for these materials, but such substitution can only go so far.

One event that could solve the feedstock question would be a recession, which never arrived in 1979 for petrochemicals but which may now be close. However, there is some reason to hope that 1980 will not repeat the crushing setback of the recession in 1975. Even with its unusual financial gains, 1979 was no 1974, when petrochemical prices and market value more than doubled and plant capacity literally ran out. Without the same degree of excess, 1979 could lead to a milder correction in 1980.

Bruce Greek, C&EN Houston, and William Fallwell, C&EN New York

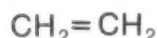
Unused capacity will resume climb for all major petrochemicals in 1980

% of nameplate capacity unused



Sources: Industry, C&EN estimates

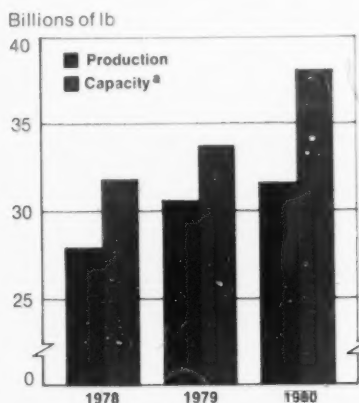
Key Chemicals



Ethylene

- Demand growth iffy
- Capacity well up
- Prices still rising

PRODUCTION/CAPACITY



a As of first quarter

HOW MADE

Thermal (steam) or catalytic cracking of hydrocarbons ranging from natural-gas-derived ethane to petroleum-derived gas oil

MAJOR DERIVATIVES

Polyethylenes 45%, ethylene oxide 2%, glycol 2%, vinyl chloride 15%, styrene 10%

MAJOR END USES

Fabricated plastics 65%, antifreeze 10%, fibers 5%, solvents 5%

FOREIGN TRADE

Negligible

PRICES

16 to 19 cents per lb

COMMERCIAL VALUE

\$4.5 billion for total production, 1979

U.S. ethylene producers are ending a good, if not excellent, year. They have the plant potential to repeat, but market and feedstock costs may not allow it if a recession deepens in the U.S. in 1980.

As yet signs are very unclear as to how much of a recession there really is in the U.S. Signs are clear enough, however, that many in the industry doubt there will be a repeat in 1980 of 1979's growth in ethylene production.

Unfortunately, a lot of new capacity is just going on stream and more is coming during 1980.

Production of ethylene during 1979 will hit a record, exceeding 30 billion lb, up about 10% from 1978.

Plant operations in 1979 were close to 90% of average nameplate capacity. This is about the practical limit. During the spring, some tightness in ethylene supply developed as some plants were closed down for maintenance.

A repeat of this near-optimum level of operation will not occur in 1980. Production optimistically will increase 1 billion lb or less, a 3% gain. But plant capacity will be up more than 4 billion lb as the year begins. Additional capacity will be coming on stream in the spring and could be operated enough during the second half of the year to add the equivalent of another 1 billion lb of capacity for the year. As a result, plant operations during 1980 probably will average a bit more than 80% for the industry.

This undesirably low level of plant use could set the stage for profitability trouble in 1980. If a U.S. recession cuts deeply into ethylene markets, which are centered on consumer plastics in uses led by packaging, ethylene producers will have a hard time passing along increased raw materials costs to customers. Plant use could be even worse than 80% in 1980 if ethylene production drops from 1979, as a minority of industry observers expect.

However, many plants are scheduled to be closed down sometime during the year for maintenance. Some of this maintenance has been deferred from 1979 because of market pressure. A major turnaround on an ethylene plant typically takes six weeks, or about 10% of the year.

Such maintenance, important to a

plant that may have cost \$500 million, can be deferred only so long before risk of a major accident becomes high. It's considered good business to handle these major turnarounds when demand is slack, as anticipated for the first half of 1980.

Accurate estimates of operating levels depend on good estimates of production, which have been under suspicion during 1979. Apparently some double counting has been found in production numbers, which possibly are inflated.

The problem appears to be in integrated plant complexes, where unreacted ethylene from derivative production is recycled through the purification sections of ethylene plants for cleanup and counted twice as ethylene output. Thus, 1980 production figures are expected to become more accurate as recycled ethylene is eliminated.

Besides uncertainty in demand because of recession, uncertainty in ethylene feedstocks concerns producers. During 1979, a major change in feedstocks occurred as producers moved to use more natural-gas-derived ethane and propane in their ethylene-producing steam crackers at the expense of naphtha and gas oil from oil refineries. The quantity of naphtha in particular has been reduced because of its value and demand in gasoline. Most basic hydrocarbon mixtures that fall into the naphtha category can be used in either gasoline or olefins. Similarly, gas oil can be used either in home heating oil or in olefins.

A major cost advantage continues to exist for the light hydrocarbon feedstocks, although this advantage has shrunk somewhat. As long as the light hydrocarbons are available, they will get the nod for use in steam crackers.

Even so, feedstock costs continue to pressure product prices. After a prolonged calm, ethylene prices shot up in July and October from 14 cents to the current 16- to 19-cent range. Price pressure will continue.

Prices of ethylene derivatives haven't gone up enough yet to dampen exports significantly. As U.S. sales of ethylene derivatives have weakened, exports have continued strong. Exports in 1980 could be the key to ethylene-production growth, or lack of growth, during the year.

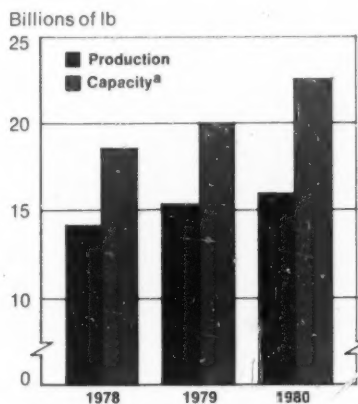
Key Chemicals



Propylene

- **Demand big question**
- **Capacity expanding**
- **Prices rising**

PRODUCTION/CAPACITY



HOW MADE

Recovered from cracked gas streams of oil refineries, coproduct streams of steam-cracking ethylene plants

MAJOR DERIVATIVES

Polypropylene 25%, acrylonitrile 15%, isopropyl alcohol 10%, propylene oxide 10%

MAJOR END USES

Fabricated plastics 50%, fibers 15%

FOREIGN TRADE

Exports—negligible; imports—small, about 500 million lb

PRICES

Polymer grade—15 to 16 cents per lb, chemical grade—1 cent per lb less

COMMERCIAL VALUE

\$2 billion for total production, 1979

Propylene production for use in chemicals in 1980, like ethylene, won't repeat the strong performance of 1979. Propylene, as always, will be heavily influenced by ethylene production because of its coproduct status in olefins-producing steam-cracking plants. But important differences could develop for propylene in 1980 because of changed feedstocks.

Depending on ethylene production volume and feedstocks, propylene might tighten enough to reduce the long-standing 3-cent differential in price between the two a quarter or half a cent. Even so, change also might not last.

Propylene production, though well up in 1979, is trailing the percentage gain for ethylene. The reason is a shift in feedstocks at steam crackers during the year to ethane and propane at the expense of naphtha and gas oil. This penalizes propylene output gains.

Propylene production is up 1 billion lb for 1979, or 6 to 7%, to 15.2 billion lb. This amounts to 50% of ethylene output, compared to 51% in 1978.

In 1980, industry sources expect that nearly all additional ethylene and propylene output will come from ethane and propane feedstocks. Hence, propylene again may trail ethylene output growth, and supplies of propylene could tighten unless the recession intervenes. The other major source of propylene, besides steam crackers, is refinery catalytic cracking operations, which also supply small quantities of ethylene. Here, however, the situation is complicated by competing demand for fuels.

Propylene available from refineries could be enough for chemicals if enough incentive (the right price) comes from chemical producers to recover this propylene. Chemical producers must bid away propylene that otherwise would be used in making alkylate with C₄'s and C₅'s for blending into gasoline. Some refinery propylene is even burned on the spot for fuel or mixed with propane fuel.

The potential availability of propylene for chemicals from refineries accounts for the large officially unused plant capacity to produce propylene.

How much of a price incentive is needed to lure this propylene to chemicals depends on an individual refiner's situation. If, for example, the refiner

needs additional hydrocarbons to meet gasoline requirements, especially for high-octane grades, and has a reasonably good supply of a high-octane blending component such as toluene, he would be more likely to put more propylene alkylate into his gasoline pool and allow less to go to chemical uses.

How strongly chemical producers will have to bid for refinery propylene will depend on chemical demand. Nothing spectacular is expected to happen to demand for propylene during 1980 except for exports of polypropylene. Overall, propylene output is expected to increase 4% in 1980 to 15.8 billion lb.

Polypropylene exports during some months in early 1979 were more than double exports a year earlier. This pace appeared to slacken near midyear, but in August, the latest month for which data are available, exports picked up some 20 million lb over July for a 110% gain from August 1978.

One of the reasons suggested for the renewed rise in polypropylene exports is that more polypropylene was available. Plant production problems have hampered output of polypropylene during 1979 but now may be over, allowing greater use of plant capacity.

Higher polypropylene output will push up demand for propylene. This gives the potential of tightening propylene supply if its production is limited by lighter feedstocks in steam crackers.

The other important uses of chemical- and polymer-grade propylene likely will have modest growth during 1980. The consumer products made from these derivatives as well as from polypropylene will be influenced by economic conditions and consumer discretionary spending. Furniture sales, for example, could be hurt during a recession. This would lower demand for polypropylene fibers as well as polyurethanes made from propylene oxide.

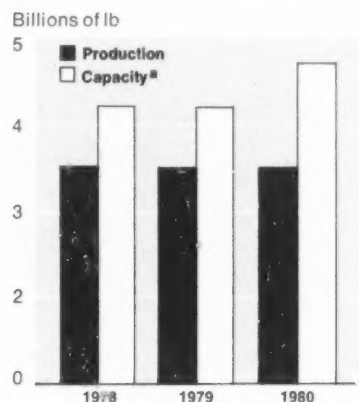
Propylene producers maintain an optimistic view and plan to have all the product that consumers will need. At the same time, costs of making chemical- and polymer-grade propylene are going up. Propylene prices will have little chance to avoid increases even if demand falls unexpectedly more than current readings of the recession suggest.

Key Chemicals

Butadiene

- Demand flat
- Capacity variable
- Prices rising

PRODUCTION/CAPACITY



a As of first quarter. Combined capacity for dehydrogenation and extraction from cracked-gas streams.

HOW MADE

Recovery from coproduct streams of ethylene-producing steam crackers, dehydrogenation of butylene or butane from refineries and natural gas

MAJOR DERIVATIVES

Styrene-butadiene rubber 50%, polybutadiene rubber 20%, other rubbers 10%, hexamethylenediamine

MAJOR END USES

Tires and other rubber products 80%

FOREIGN TRADE

Exports—about 100 million lb;
imports—about 450 million lb

PRICES

Contract—27 cents per lb

COMMERCIAL VALUE

\$850 million for total production, 1979

Butadiene will have another flat year in 1980. For a variety of reasons, U.S. production of the only commercially important diolefin will hold at the same level of 3.5 billion lb as in 1978 and 1979.

U.S. demand, which is partially satisfied by imports, will be down slightly in 1979 and may be up slightly next year. These demand changes, however, are small, on the order of 1%. The most important reason for butadiene's stagnation is lack of "incentive" (the price bid by producers) to justify getting feedstock materials away from other uses.

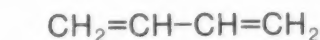
Behind the lack of incentive is a fundamental, long-term market problem—no growth in the dominant end use area, tires. Rubber going into tires is the only market that really matters for butadiene. This is unfortunate, since the tire business has been a leading casualty of the energy crisis in the U.S.

After a dearth of net expansion in 1977 and 1978, plant capacity to make butadiene has risen during 1979 and will rise again during 1980. Perhaps a quarter of this capacity will not be used in 1980.

Before 1979, capacity to make butadiene declined in the U.S. Plants dehydrogenating normal butane to butadiene were permanently closed and not fully offset by new capacity from olefins-producing steam crackers. The decline in capacity has been halted because the closing of dehydrogenation plants has stopped, at least temporarily.

However, adding new capacity doesn't necessarily cause production to grow. The lack of growth in butadiene production involves some complex feedstock economics. Briefly, even though most new olefins plants are built to use naphtha or gas oil feedstocks, they are being fed significant amounts of light hydrocarbons—ethane, propane, and butane—because these materials are less expensive generally than naphtha and gas oil, which can be used in gasoline and fuel oil. The result of using the lighter hydrocarbons as feedstocks is lower production of butadiene.

Since not as much butadiene is available from olefins plants as forecast, production of butadiene from dehydro-



genation plants continues. The lives of these old dehydrogenation plants could become much longer than anyone had thought, if sustained production of light hydrocarbons feedstocks from natural gas for olefins plants continues at high levels.

Certainly not helping butadiene production is the market, mostly rubber for tires. During late 1978 and early 1979, rubber and tire production ran at near capacity in anticipation of a possibly long strike by the United Rubber Workers. When the strike didn't develop, tire inventories were suddenly excessive.

On top of this, demand for tires this summer failed to reach anticipated levels. One reason was the shortage of gasoline, which, in turn, led to relatively more in-town driving in contrast to high-speed country driving. This change in driving habits increased tire life. Increased use of radial tires also increased tire life. Automobile production also declined, which further reduced demand for tires and other fabricated rubber items used in autos.

Thus, the outlook for styrene-butadiene rubber (SBR) production for 1980 ranges from a possible decline of 1% to a small growth of 1.5%. Output of other types of rubber that incorporate butadiene may not decline, but neither will it grow very much in 1980. Demand for butadiene in these polymers is small compared to SBR.

Another polymer, acrylonitrile-butadiene-styrene, ranks well behind rubbers as a use for butadiene. Demand for ABS resins is forecast optimistically to grow moderately, about 5 to 7% annually, but this kind of growth rate will do little to change demand for butadiene.

Use of butadiene in making nylon through a precursor, hexamethylene diamine, continues to grow slowly but may have a recessionary breather. Again, this use is not big enough to offset declines or no growth in production of SBR.

On balance, butadiene will have a lackluster year in 1980. Production will be about constant. Prices will rise as hydrocarbon costs increase. The price increases could go through a series of postings initially higher than selling prices, but with the net increase about that of crude oil. As a result, profitability will remain little better than marginal.

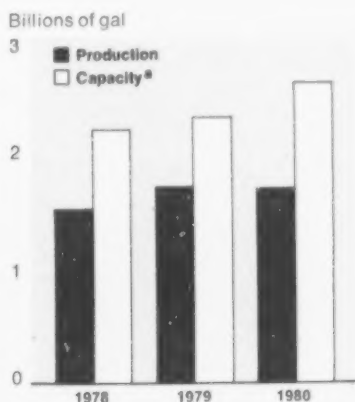
Key Chemicals

Benzene



- **Demand steady**
- **Capacity up modestly**
- **Prices pushing up**

PRODUCTION/CAPACITY



HOW MADE

Separated from catalytic reformat from oil refineries, from pyrolysis gasoline from steam-cracking ethylene plants, and from coal tar; dealkylation of toluene

MAJOR DERIVATIVES

Ethylbenzene 50%, cumene 15%, cyclohexane 15%, aniline 5%

MAJOR END USES

Polystyrene 25%, nylons 20%, other styrenic polymers 10%

FOREIGN TRADE

Exports and imports small

PRICES

Contract—\$1.50 to \$1.60 per gal.
spot—about \$1.65 per gal

COMMERCIAL VALUE

\$2.5 billion for total production, 1979

U.S. benzene production will be up substantially in 1979, 13% to 1.7 billion gal, but is expected to level off during 1980 for the usual reasons in an economic recession.

Nameplate capacity for benzene also will be up 13%, to 2.6 billion gal, by first-quarter 1980 from a year ago. Most of the new capacity will be for coproduction at olefins-producing steam crackers. Some smaller additional capacity will become available during 1980.

The growth in benzene production during 1979 could have been even larger, since more capacity to make this aromatic was certainly there. The cap on production was set by feedstock availability and demand.

The feedstock limitation traces back to the major hydrocarbon problem of 1979, Iran's cutoff of oil in the first half. But it also involves lower-cost light hydrocarbons being used in steam crackers to make ethylene replacing some naphtha and gas oil. The lighter feedstocks produce less benzene.

Production of benzene and other aromatics in oil refineries, another major source in catalytic reforming processes, is slowly failing because of changes in the kinds of crude oil available to refiners. In general, supplies of light, low-sulfur crude oil that is rich in precursors for aromatics continue to decline throughout the world. This change has nothing to do with politics or other non-technical factors. It is the result of the more desirable crude oils being used first, as might be expected for any naturally occurring commodity.

The crude oil evolution also changes feedstocks to refineries' catalytic reformers. These feedstocks are generally in the gas oil (light fuel oil) range. They don't have so high a concentration of naphthenes and aromatics as the feedstocks expected when the reformers were designed. As a result, reformer output drops.

The obvious way to regain reformers' yields of aromatics would be to collect refineries' hydrocarbon fractions that are closer to the ideal reformer feedstocks. This would raise aromatics production but at a possible penalty to other refinery products. To date, this is not being done extensively.

The other capacity-type limitation to

higher benzene production in 1979 has been capacity ceilings at derivatives plants. Some derivatives capacity simply gave out. In others, there were mechanical problems limiting operations for various periods.

Availability of other nonbenzene raw materials for these benzene derivatives was not a serious problem. For example, there was adequate ethylene for making ethylbenzene and propylene for making cumene.

The outlook for benzene volume in 1980 depends on derivatives exports. For example, exports of styrene, phenol, and cyclohexane currently account for 10 to 20% of U.S. production. Such a strong export position results from the cost advantage U.S. producers have over foreign producers because of the remaining price controls on part of U.S. crude oil.

However, this cost advantage for U.S. derivatives production is narrowing with time. The eventual result will be declines in benzene derivatives exports, possibly in 1980 for some.

U.S. markets for most benzene derivatives are expected to remain flat or be modestly higher in 1980. Sales of some derivatives will decline—for example, phenol because of the recession's impact on housing, its most important end use. Such declines will offset gains in other benzene uses.

Styrene in the U.S. also could be adversely affected by the recession. The clumping tire market is an example, through its use of styrene-butadiene rubber. In polystyrene, the diversity of uses probably will moderate the effects of a recession, but polystyrene production likely will grow less in 1980 than its 5% rate in 1979.

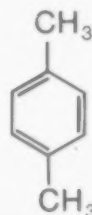
Overall, even with export strength, phenol and cyclohexane could have small net declines in benzene demand in 1980. Cyclohexane faces a double threat in U.S. markets in 1980. Its only important outlet, nylon fiber, depends heavily on housing (carpets) and textiles. Both areas traditionally are early victims of recession. This time, both are showing some weakness.

The net outlook for benzene in 1980 is for no change in production, small use of new capacity, and efforts by producers to keep prices rising in line with crude oil prices.

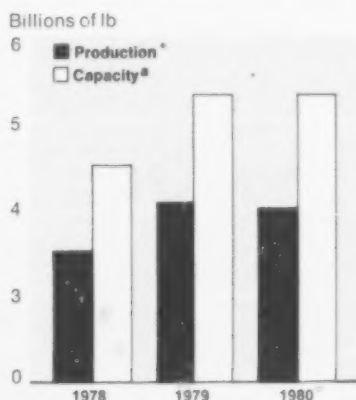
Key Chemicals

p-Xylene

- Demand to fall
- Capacity flat
- Profitability shaky



PRODUCTION/CAPACITY



HOW MADE

Separated from mixed xylenes made in oil refineries, catalytic reformers, or in steam-cracking ethylene plants

MAJOR DERIVATIVES

Dimethyl terephthalate 55%, terephthalic acid 45%

MAJOR END USES

Polyester fibers, films, and fabricated items 100%

FOREIGN TRADE

Exports—might reach 700 million lb in 1979; imports—negligible

PRICE

Contract—26 cents per lb, spot market—negligible

COMMERCIAL VALUE

\$900 million for total production, 1979

To some market analysts in the U.S. chemical industry, the outlook for *p*-xylene has become grim. True, production rose substantially through much of 1979, leading to a likely 17% annual gain to 4.1 billion lb. Plenty of plant capacity was available with a nameplate total of 5.3 billion lb all year. And prices about doubled in steps during the year.

That would be a more-than-pleasing performance for an old petrochemical had not a dark cloud come over *p*-xylene in the third quarter. Demand for its dominant derivative, polyester for fiber, fell significantly. With the current emphasis on minimizing inventory throughout the chemical product chain, producers of *p*-xylene expect a demand slump for their product in the near future.

As a result, *p*-xylene is one of the first chemicals in line for trouble from a U.S. recession in 1980. The cold-eyed view calls for a slowing in *p*-xylene demand during fourth-quarter 1979 but perhaps not to a point below demand a year ago.

However, demand would drop year-to-year in first-quarter 1980. The decline could be large, as much as 10% of production.

Output of *p*-xylene might improve in second-quarter 1980 but would still trail output in second-quarter 1979. Then a flat-to-slightly-improved third quarter is forecast and a still better fourth quarter.

The recovery in late 1980, however, would not be enough to offset the disastrous first quarter and a weak second quarter. For this reason, *p*-xylene production in 1980 likely will decline a bit, about 2 to 3%, from 1979.

Capacity for *p*-xylene will stay the same in 1980 as might be expected from the size of current unused capacity, more than 20% rising to possibly 25% next year. If annual demand growth after the recession remains relatively low, averaging 5 to 7%, capacity expansion seems unlikely for the next several years.

No important limitations to production are likely from raw material supply of mixed xylenes from oil refineries or olefins-producing steam crackers. Most of the xylenes supply comes from refineries' catalytic reformers, whose ar-

omatics output is falling slowly long-term because of a lack of suitable feedstocks.

Tightness did develop in supplies of mixed xylenes earlier in 1979 as the gasoline shortage worsened. Anything that had good octane value was needed for gasoline. Prices of these gasoline materials went up faster than did *p*-xylene prices for a while. A quick look at economics shows that profitability of extracting *p*-xylene for chemicals was meager, so feedstock to *p*-xylene separation plants was limited.

Later in 1979, when *p*-xylene prices rose two thirds, *p*-xylene could be recovered from mixed xylenes with good profit margins. Mixed xylenes probably will continue to increase in price, even though competing toluene is a slightly better octane-boosting component for gasoline.

However, efforts to pass through additional cost increases for *p*-xylene could be difficult during first-quarter 1980 if demand slumps. The old profitability problem would then return.

Profits also could be hit from another side, the export market, which is taking more than 15% of U.S. production in 1979. Exports are forecast to decline in 1980 as cost increases continue for crude oil in the U.S. and as new capacity for *p*-xylene starts up in other parts of the world. New plants outside the U.S. could become competitive suppliers both in local markets and in the general export market.

In the U.S. market, much is being made of the fast-rising use of derivative polyester in soft-drink bottles. The growth rates in these uses are large, but the product base is still small. As a result, the impact on gross *p*-xylene demand will be hard to discern in the next year.

Farther in the future, *p*-xylene use in bottles could become major, especially if the trend continues for bottle-curbing litter laws to fail in legislatures, referendums, and the courts.

In sum, for 1980 *p*-xylene's demand problems for polyester fiber could lower production from 1979. If recovery takes hold in late 1980, only one year of lower production of *p*-xylene will occur this time, in contrast to the two-year recovery time needed after the 1974-75 recession.